

What is claimed is:

1. A file level striping apparatus comprising:

5 a number of disks, accessed with physical block numbers, for storing information actually;

a volume manager for logically grouping a number of disks to form a single large logical volume, wherein the volume manager records the information for managing the logical volume to the participating disks and manages it;
10 and

a file system, which recognizes the logical volume as a single storage device, for generating files on a logical volume and performing I/O operations for the generated files with logical block numbers which are applied to the logical
15 volume.

2. The file level striping apparatus of claim 1, wherein the logical volume is provided by the volume manager and accessed with logical block numbers.

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3. The file level striping apparatus of claim 1, wherein any one of the plurality of disks includes:

a volume label area for storing information generated by the volume manager and required for managing the logical
25 volume;

a free space bitmap area for controlling block

allocation;

a mapping table area for storing information about the correspondence relationship of the physical blocks and the logical blocks; and

5 a data area, which is a collection of physical blocks for storing data, comprising the remaining space of said disk except for a volume header area including the volume label area, the free space bitmap area and the mapping table area.

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4. A file level striping method employing a file system and a volume manager, the method comprising the steps of:

adding an option for indicating whether or not to support file level striping to the file creation interface
15 in the file system;

extending an inode structure to include a last disk ID field;

initializing the last disk ID when a file is created in the file system;

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allocating a physical block based on the last disk ID when a physical block allocation is required at the time of file I/O request in the file system; and

modifying the last disk ID value to reflect the physical block allocation made by the volume manager.

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5. The file level striping method of claim 4, said step of initializing the last disk ID comprising further the steps of:

determining whether the bit for designating file level striping is set in a mode given as an option when a file is created in the file system;

selecting a random integer in the range of the number of disks participating in the logical volume to set the last disk ID value; and

setting the last disk ID value to -1 if said bit is not set meaning that the file does not support the file level striping.

6. The file level striping method of claim 5, wherein the random integer is selected to prevent the data block allocation being concentrated to a disk corresponding to the initial value of the last disk ID when the initial values of the last disk ID of all the files supporting the file level striping are set constant at a specific value.

7. The file level striping method of claim 4, wherein said option is formed by adding a bit to the mode which is given as an option of the file creation interface.

8. The file level striping method of claim 4, wherein said step of allocation a physical block and said step of

modifying the last disk ID value further comprising the steps of:

requesting a file I/O operation;

determining which logical block corresponds to the
5 requested file I/O operation;

requesting the volume manager or a lower level I/O system to perform said determined logical block I/O operation;

performing an address mapping process in order to
10 determine which disk and which physical block therein correspond to said logical block;

performing I/O operation for the physical block determined to correspond to said logical block at the address mapping process;

15 checking the value of the last disk ID of the inode corresponding to the file if physical block allocation turns out to be required since the logical block is used for the first time at the address mapping process;

selecting the disk of a number next to the value of
20 last disk ID 601 if the value of the last disk ID 601 turns out to be in the range from 0 to the number of the disks associated with the logical volume minus 1;

performing physical block allocation referring to the free space bitmap of said selected disk;

25 updating the mapping table with the allocation result and performing I/O operation for the file on the physical

block;

changing the value of the last disk ID if I/O operation on the physical block is completed; and

performing I/O operations repeatedly on the physical
5 block for the physical block allocation to be distributed uniformly across the whole disks.

9. The file level striping method of claim 8, wherein said method further comprising the step of selecting a disk
10 in which block allocation to be performed referring to a variable for determining the disk in which the next physical block allocation to be performed if the value of the last disk ID 601 turns out -1 at said checking step.

15 10. The file level striping method of claim 8, wherein said method further comprising the step of setting the last disk ID value to be the ID of the disk in which block allocation is made only if physical block allocation is done and the last disk ID value for the file is not -1.

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